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**MESSAGE:**

In re The Application of Ackerman, et al.  
Application No. 10/735,370

Appeal Brief (18 pages)  
Transmittal Form (1 page)  
Fee Transmittal Form (1 page)

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PTO/SD/97 (09-04)

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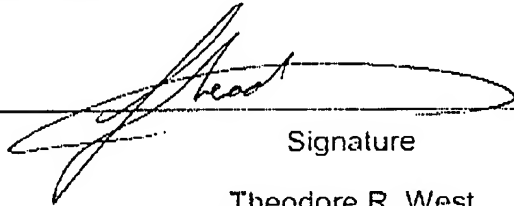
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PTO/SD/21 (09-04)

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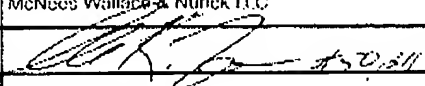
22

|                        |                           |
|------------------------|---------------------------|
| Application Number     | 10/735,370                |
| Filing Date            | December 12, 2003         |
| First Named Inventor   | Ackermann, et al.         |
| Art Unit               | 1762                      |
| Examiner Name          | K. Bamford                |
| Attorney Docket Number | 130013711021 (21630-0116) |

## ENCLOSURES (Check all that apply)

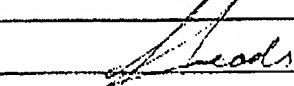
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| Remarks  |  |   |

## SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

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|--------------|---|----------|--------|
| Firm Name    | McNees Wallace & Nurick LLC   |          |        |
| Signature    |  |          |        |
| Printed name | Shawn K. Leppo, Esq.  |          |        |
| Date         | December 8, 2005  | Reg. No. | 50,311 |

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| Signature             |  |      |                  |
| Typed or printed name | Theodore R. West  | Date | December 8, 2005 |

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Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4918)**FEE TRANSMITTAL**  
**For FY 2005**☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT (\$)

500.00

**Complete if Known**

|                      |                           |
|----------------------|---------------------------|
| Application Number   | 10/735,370                |
| Filing Date          | December 13, 2003         |
| First Named Inventor | Ackerman, et al.          |
| Examiner Name        | K. Baroford               |
| Art Unit             | 1762                      |
| Attorney Docket No.  | 130013/11921 (21635-0116) |

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**FEE CALCULATION****1. BASIC FILING, SEARCH, AND EXAMINATION FEES**

| Application Type | FILING FEES |                       | SEARCH FEES |                       | EXAMINATION FEES |                       | Fees Paid (\$) |
|------------------|-------------|-----------------------|-------------|-----------------------|------------------|-----------------------|----------------|
|                  | Fee (\$)    | Small Entity Fee (\$) | Fee (\$)    | Small Entity Fee (\$) | Fee (\$)         | Small Entity Fee (\$) |                |
| Utility          | 300         | 150                   | 500         | 250                   | 200              | 100                   |                |
| Design           | 200         | 100                   | 100         | 50                    | 130              | 65                    |                |
| Plant            | 200         | 100                   | 300         | 150                   | 160              | 80                    |                |
| Reissue          | 300         | 150                   | 500         | 250                   | 600              | 300                   |                |
| Provisional      | 200         | 100                   | 0           | 0                     | 0                | 0                     |                |

**2. EXCESS CLAIM FEES****Fee Description**

Each claim over 20 (including Reissues)

| Fee (\$) | Small Entity Fee (\$) |
|----------|-----------------------|
| 50       | 25                    |

Each independent claim over 3 (including Reissues)

200 100

Multiple dependent claims

360 180

| Total Claims | Extra Claims | Fee (\$) | Fee Paid (\$) |
|--------------|--------------|----------|---------------|
| - 20 or HP = | x            | =        |               |

HP = highest number of total claims paid for, if greater than 20

| Indep. Claims | Extra Claims | Fee (\$) | Fee Paid (\$) |
|---------------|--------------|----------|---------------|
| - 3 or HP =   | x            | =        |               |

HP = highest number of independent claims paid for, if greater than 3.

**3. APPLICATION SIZE FEE**

If the Specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is \$250 (\$125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

| Total Sheets | Extra Sheets | Number of each additional 50 or fraction thereof | Fee (\$) | Fee Paid (\$) |
|--------------|--------------|--|----------|---------------|
| - 100 =      | / 50 =       | (round up to a whole number) x                   | =        |               |

**4. OTHER FEE(S)**

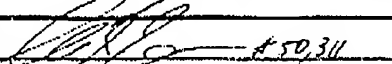
Non-English Specification. \$130 fee (no small entity discount)

Fees Paid (\$)

Other (e.g., late filing surcharge): Appeal Brief fee (37 C.F.R. 41.20(b)(2))

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**SUBMITTED BY**

|                   |  |                                   |        |                          |
|-------------------|--|-----------------------------------|--------|--------------------------|
| Signature         |  50,311 | Registration No. (Attorney/Agent) | 50,311 | Telephone (717) 232-8000 |
| Name (Print/Type) | Shawn K. Leppo, Esq.   |                                   |        | Date December 8, 2005    |

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Attorney Docket No. 130013/11921 (21635-0116)  
Serial No. 10/735,370

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BOARD OF PATENT APPEALS AND INTERFERENCES

|                                |   |                       |
|--------------------------------|---|-----------------------|
| In re Application of:          | ) |                       |
| John Frederick Ackerman et al. | ) | GAU: 1762             |
|                                | ) |                       |
| Application No. 10/735,370     | ) | Examiner: K. Bareford |
|                                | ) |                       |
| Filed: December 12, 2003       | ) |                       |

For: ARTICLE PROTECTED BY A THERMAL BARRIER COATING HAVING A CERIUM  
OXIDE-ENRICHED SURFACE PRODUCED BY PRECURSOR INFILTRATION

**APPEAL BRIEF**

MAILSTOP APPEAL BRIEF - PATENTS  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

Applicant files this Appeal Brief, together with a Fee Transmittal authorizing payment of the requisite fee. A Notice of Appeal and fee were previously filed.

**I. Real Party in Interest.**

The real party in interest is the General Electric Co.

**II. Related Appeals and Interferences.**

Applicant is not aware of any related appeals or interferences.

12/09/2005 HNGUYEN1 00000093 501059 10735370

01 FC:1402 500.00 DA

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Serial No. 10/735,370

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**III. Status of claims.**

Claims 1-17 were filed. During prosecution, claims 1, 9, and 13 were amended, and claims 8 and 12 were cancelled. Claims 1-7, 9-11, and 13-17 were finally rejected in a Final Office Action dated July 11, 2005 (hereinafter "Final Office Action"). The final rejection of claims 1-7, 9-11, and 13-17 is appealed.

**IV. Status of amendments.**

A Response to Final Office Action was filed, but it contained no claim amendments.

**V. Summary of claimed subject matter.**

A thermal barrier coating system may be used to protect the components of a gas turbine engine that are subjected to the highest temperatures. The currently preferred thermal barrier coating is yttria-stabilized zirconia (YSZ), which is zirconia (zirconium oxide) with from about 2 to about 12 percent by weight yttria (yttrium oxide). When the YSZ is initially deposited, there are small gaps between the generally columnar grains. It has been recognized that the addition of sintering inhibitors to the YSZ reduces the tendency of the gaps between the columnar grains to close by sintering during service of the thermal barrier coating. A number of sintering inhibitors have been proposed. However, these sintering inhibitors have various shortcomings, and prior to the present invention there was a need for more effective sintering inhibitors.

As recited in claim 1, a method for preparing a protected article comprises first providing the article, step 20 of Figure 1. An example of an article 40 to be protected is a gas turbine blade 42, illustrated generally in Figure 2 and in detail with the various coatings in Figures 3 and 4. A bond coat 60 is deposited onto an exposed surface 62 of the article 40, step 22 of Figure 1. A thermal barrier coating 64 is produced on an exposed surface 66 of the bond coat 60, step 24 of Figure 1. The step 24 of producing the thermal barrier coating 64 includes the steps of depositing a primary ceramic coating 68 onto the exposed surface 66 of the bond coat 60, step 26 of Figure 1. This completes the deposition of the basic thermal barrier coating system, but the primary ceramic coating 68 would be subject to degradation by sintering mechanisms, but for the following steps.

To reduce the adverse effects of the sintering, a cerium-oxide-precursor compound 78 is then deposited onto an exposed surface 72 of the primary ceramic coating 68, step 28 of Figure 1. The cerium-oxide-precursor compound 78 may not be cerium oxide with cerium in a +4 oxidation state. The cerium-oxide-precursor compound 78 is then heated in an oxygen-containing atmosphere to

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form cerium oxide with cerium in the +4 oxidation state adjacent to the exposed surface of the primary ceramic coating 68, step 30 of Figure 1. See Specification at page 8, line 21 to page 9, line 12.

As recited in claim 9, a method for preparing a protected article comprises the steps of providing a nickel-base superalloy article 40 that is a component of a gas turbine engine, step 20 of Figure 1. A bond coat 60 is deposited onto an exposed surface 62 of the article 60, step 22 of Figure 1. A thermal barrier coating 64 is deposited on an exposed surface 66 of the bond coat 60, step 24 of Figure 1. The step 24 of producing the thermal barrier coating includes the steps of depositing a yttria-stabilized zirconia primary ceramic coating 68 onto the exposed surface 66 of the bond coat 60, step 28, and infiltrating a cerium-oxide-precursor compound 78 from an exposed surface 72 of the primary ceramic coating 68 into the primary ceramic coating 68. The cerium-oxide-precursor compound 78 is not cerium oxide with cerium in a +4 oxidation state. The cerium-oxide-precursor compound 78 is heated to form cerium oxide with cerium in the +4 oxidation state adjacent to the exposed surface 72 of the primary ceramic coating 68. See *Id.*, pg. 4, lines 21-23.

As recited in claim 13, a method for preparing a protected article comprises the steps of providing the article 40, step 20, depositing a bond coat 60 onto an exposed surface 62 of the article, step 22, and producing a thermal barrier coating on an exposed surface 66 of the bond coat 60. The thermal barrier coating comprises a primary ceramic coating 68 on the exposed surface 66 of the bond coat 60, and a sintering-inhibitor region at a surface 72 of the primary ceramic coating 68. The sintering-inhibitor region comprises cerium oxide with cerium in the +4 oxidation state in a concentration greater than a general cerium oxide concentration in the primary ceramic coating. Specification at page 8, line 21 to page 9, line 18.

A key feature in all of the claims is that cerium oxide with cerium in the +4 oxidation state is present at the surface of the primary ceramic coating. As stated at page 3, lines 17 to 25 of the Specification,

The cerium-oxide-precursor compound reacts to form cerium (+4) oxide,  $\text{CeO}_2$ , rather than a more-complex compound such as a perovskite or a pyrochlore. When yttria is added to zirconia, it produces an excess of oxygen vacancies, which allows oxygen to rapidly diffuse through the thermal barrier coating. The formation of  $\text{CeO}_2$  with cerium in the +4 valence state acts to remove the oxygen vacancies to thereby slow the diffusion of oxygen anions through the ceramic. The reduction in oxygen diffusion impedes the sintering behavior of the ceramic structure. Sintering is a surface-diffusion-related phenomenon, and the cerium oxide provides a sinter-inhibiting layer at the surface of the primary ceramic coating rather than distributed throughout the primary ceramic coating.

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Serial No. 10/735,370

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That is, the cerium oxide with Ce in the +4 oxidation state yields specific benefits in terms of the subsequent performance of the product.

**VI. Grounds of rejection to be reviewed on appeal.**

Ground 1. Claims 13-17 are rejected under 35 USC §102 over Subramanian U.S. Patent 6,296,945.

Ground 2. Claims 1-7, 9, and 11 are rejected under 35 USC §103 over Subramanian in view of Ueda U.S. Patent 5,697,992.

Ground 3. Claim 10 is rejected under 35 USC §103 over Subramanian in view of Ueda, and further in view of Taylor U.S. Patent 5,520,516.

**VII. Argument.**

Ground 1. Claims 13-17 are rejected under 35 USC §102 over Subramanian U.S. Patent 6,296,945.

**Claims 13-17**

The following principle of law applies to §102 rejections. MPEP 2131 provides: "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. The identical invention must be shown in as complete detail as is contained in the ... claim. The elements must be arranged as required by the claim..." [citations omitted] This is in accord with the decisions of the courts. Anticipation under §102 requires "the presence in a single prior art disclosure of all elements of a claimed invention arranged as in that claim." Carella v. Starlight Archery, 231 USPQ 644, 646 (Fed. Cir., 1986), quoting Panduit Corporation v. Dennison Manufacturing Corp., 227 USPQ 337, 350 (Fed. Cir., 1985)

Thus, identifying a single element of the claim not disclosed in the reference is sufficient to overcome a §102 rejection.

Claim 13 recites in part:

"a sintering-inhibitor region at a surface of the primary ceramic coating, wherein the sintering-inhibitor region comprises cerium oxide with cerium in the +4 oxidation



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state in a concentration greater than a general cerium oxide concentration in the primary ceramic coating.” [emphasis added]

Subramanian does not disclose cerium in the +4 oxidation state. In fact, in another part of the Final Office Action, the Examiner explicitly admits this to be the case. In making the rejection that forms the subsequent Ground 2 for this Appeal (a §103 rejection combining Subramanian and Ueda), the Examiner states “Subramanian teaches all of the features of these claims except that (1) the application of a non cerium oxide precursor and heating to form cerium oxide in a +4 oxidation state...”. Final Office Action, page 6, lines 5-7. Since claim 13 recites “sintering-inhibitor region comprises cerium oxide with cerium in the +4 oxidation state,” the Examiner’s rejection under 35 U.S.C. §102 cannot be maintained in light of the Examiner’s later admission when rejecting other claims in the Application.

The inconsistent position of the Final Office Action is that Subramanian does not disclose “cerium oxide with cerium in the +4 oxidation state” for the purposes of the §103 rejection, but that it does disclose this same recitation for the purposes of the §102 rejection. The §103 position is correct--Subramanian has no such disclosure.

The explanation of the rejection in rejecting subsequently cancelled claim 12 (Office Action of April 1, 2005, page 3, lines 1-3) -- which claim’s limitation of the +4 oxidation state was added to claim 13 -- referenced col. 2, line 65-col. 3, line 10 and col. 5, lines 40-50 of Subramanian to support the rejection of the +4 oxidation state limitation. These portions of Subramanian make no reference to the oxidation state, and give no composition suggesting that cerium might be in the +4 oxidation state. Subramanian teaches  $C_zO_w$  compounds as precursors of another reaction, without ever defining  $z$  and  $w$  or giving any range of values when  $C=Ce$ . The selection of the +4 oxidation state is not a matter of design choice, because Subramanian does not present any such design choice. All of Subramanian’s discussion is in general terms; it does not set forth specific compounds and valence states.

In the Response to Arguments in the paragraph bridging pages 8-9 of the Final Office Action, the Examiner states that “Since Subramanian puts no limits on  $z$  and  $w$ , it would indicate that all possible numbers for  $z$  and  $w$  are present...” This position is contrary to law and to the MPEP as quoted above. MPEP 2131 provides: “The identical invention must be shown in as complete detail as is contained in the ... claim. The elements must be arranged as required by the claim...” (internal citations omitted). The Examiner’s argument is contrary to this provision of the MPEP. The inability of a prior art reference to define a particular compound may not be taken as evidence that the prior art has defined the particular compound. Further, there is no reason to believe that

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Subramanian contemplates that  $z$  and  $w$  can include all possible numbers for  $z$  and  $w$ . Certainly Subramanian makes no such disclosure.

In the Advisory Action of September 19, 2005, the Examiner attempts to overcome the deficiency by portraying the present rejection as falling within the genus/species situation of MPEP 2131.02 in which "[a] generic chemical formula will anticipate a claimed species covered by the formula when the species can be 'at once envisaged' from the formula." The attempt to rely upon this principle is misplaced for two reasons.

First, Subramanian speaks only of " $C_zO_w$ " compounds without ever giving any value or range of values for  $z$  and  $w$ . Consequently, it cannot be said that any attempted generic interpretation of " $C_zO_w$ " necessarily encompasses the values required to anticipate "cerium oxide with cerium in the +4 oxidation state," e.g.,  $C = Ce$ ,  $z = 1$  and  $w = 2$ .

Second, for this principle to apply, an appropriate generic compound that encompasses the claimed compound (which " $C_zO_w$ ", with values of  $z$  and  $w$  unspecified, does not) must be a "limited generic class" and not a "vast number or perhaps even an infinite number of compounds." See, e.g., In re Petering (301 F.2d 676, 133 USPQ 275 (CCPA 1962)) and In re Schauman (572 F.2d 312, 197 USPQ 5 (CCPA 1978)) discussed at MPEP 2131.02. " $C_zO_w$ " covers a vast number in fact, an infinite number of compounds: " $C$ " may be any of a long list of elements (see Subramanian, col. 5, lines 34-49) and Subramanian gives no reason to interpret  $z$  and  $w$  as being limited only to integers, and therefore " $z$ " and " $w$ " can include infinitesimally graded compositional steps. See Akzo N.V. v. International Trade Commission (808 F.2d 1471, 1 USPQ2d 1241 (Fed. Cir. 1986)), also discussed at MPEP 2131.02. If a formula covers a vast or infinite number of species, then the genus does not make a particular species "at once envisaged" as it would if the genus covered a relatively limited number of species.

In short, Subramanian simply does not disclose or envisage the limitation "cerium oxide with cerium in the +4 oxidation state," or any advantages that arise from this particular structure.

**Ground 2. Claims 1-7, 9, and 11 are rejected under 35 USC §103 over Subramanian in view of Ueda U.S. Patent 5,697,992.**

#### Claims 1-7

Ueda is nonanalogous art. Stated alternatively, Ueda is not within the scope and content of the prior art that may be used in forming a §103 rejection. Its teachings are therefore not properly combined with the teachings of Subramanian. To be analogous art and properly used in forming a §103 rejection, a reference must be concerned with the same problem as another reference and the

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claims which are being addressed. See, for example, Medtronic, Inc. v. Cardiac Pacemaker, Inc., 220 USPQ 97, 104 (Fed. Cir. 1983), stating: "Faced with a rate-limiting problem, one of ordinary skill in the art would look to the solutions of others faced with rate-limiting problems."

In the present case, the inventors were concerned with thermal barrier coatings such as those applied to turbine blades and other structures, as discussed in the Background section of the Specification. Subramanian was also concerned with thermal barrier coatings (Subramanian col. 1, lines 15-22). Ueda, however, deals with abrasive particles, (Ueda col. 1, lines 7-11) and has absolutely nothing to do with thermal barrier coatings or similar structures. Ueda never mentions thermal barrier coatings or anything remotely similar. Therefore, Ueda is not properly within the scope of the prior art. A person seeking to improve thermal barrier coatings would have no reason to look to a reference discussing abrasive particles, much less look to Ueda and then attempt to extract his teachings regarding abrasives and then try to apply them to the technology of thermal barrier coatings. It is therefore not properly applied in rejecting the present claims.

Assuming, *arguendo*, Ueda was properly applied in forming the rejection, the combination of its teachings with Subramanian still does not teach the claim limitations of Applicant's claimed invention.

The following principle of law applies to all §103 rejections. MPEP 2143.03 provides "To establish prima facie obviousness of a claimed invention, all claim limitations must be taught or suggested by the prior art. In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). All words in a claim must be considered in judging the patentability of that claim against the prior art. In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970)." [emphasis added] That is, to have any expectation of rejecting the claims over a single reference or a combination of references, each limitation must be taught somewhere in the applied prior art. If limitations are not found in any of the applied prior art, the rejection cannot stand.

In the present approach, a cerium-oxide-precursor compound that is not itself cerium oxide with cerium in the +4 oxidation state is deposited on the surface of a primary thermal barrier coating material. The cerium-oxide-precursor compound is thereafter reacted to form cerium oxide with cerium in the +4 oxidation state. The present Specification explains the reasons for this approach and the improved results achieved using this approach, see for example para. [0011]-[0012], and [0029]-[0030].

In contrast, Subramanian deposits a compound that may be a cerium-containing compound of cerium and oxygen overlying an oxide thermal barrier coating material, and then reacts the cerium-containing compound with the thermal barrier coating material to make a more-complex oxide. Subramanian uses the term "precursor" to mean something very different from its use in the present claims. In the present application, the term "precursor" refers to a compound that reacts to form

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cerium oxide, while in Subramanian it refers to a cerium-oxygen compound that is reacted with another oxide to form a reaction product; thence the cerium-oxygen compound is a precursor to the reaction product.

Claim 1 recites in part:

“depositing a cerium-oxide-precursor compound onto an exposed surface of the primary ceramic coating, wherein the cerium-oxide-precursor compound is not cerium oxide with cerium in a +4 oxidation state, and heating the cerium-oxide-precursor compound in an oxygen-containing atmosphere to form cerium oxide with cerium in the +4 oxidation state adjacent to the exposed surface of the primary ceramic coating.” [emphasis added]

Subramanian teaches deposition of a compound that may be a cerium-containing compound of cerium and oxygen overlying an oxide thermal barrier coating material, and then reacts the cerium-containing compound with the thermal barrier coating material to make a more-complex oxide that is apparently not “cerium oxide with cerium in the +4 oxidation state.” More specifically, in the present application, the term “precursor” refers to a compound that is not cerium oxide with cerium in the +4 oxidation state, but which reacts to form cerium oxide with cerium in the +4 oxidation state, while in Subramanian it refers to a cerium-oxygen compound that is reacted with another oxide to form a reaction product; thence the cerium-oxygen compound is a precursor to the reaction product.

Thus, Subramanian has no teaching that the cerium-oxide-precursor compound is not cerium oxide with cerium in a +4 oxidation state, and that heating in an oxygen-containing atmosphere forms cerium oxide with cerium in the +4 oxidation state.

There is no teaching in Subramanian of producing cerium in the +4 oxidation state. The selection of the +4 oxidation state achieves important advantages as set forth in para. [0012] and [0030] of the present Specification. The selection of the +4 oxidation state is not a matter of design choice, because Subramanian does not present any such design choice. All of Subramanian's discussion is in general terms, without setting forth specific compounds and valence states.

Ueda teaches that a compound that is not cerium oxide may be converted to cerium oxide, specifically that ammonium cerium sulfate may be calcined to cerium oxide. That teaching has no relevance at all to the teachings of Subramanian. Subramanian never teaches converting something that is not cerium oxide to cerium oxide, but in fact starts with a cerium-oxygen compound of the form  $C_zO_w$ , without ever defining  $z$  and  $w$  when  $C=Ce$ , and then reacts the cerium-oxygen compound with another oxide to get a more-complex oxide reaction product. See for example Subramanian,

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col. 2, line 57-col. 3, line 25. Consequently, there is no motivation or objective basis for combining the teachings of these references.

The explanation of the rejection (page 7, line 9 of Final Office Action) and Response to Arguments (page 10, line 15 of Final Office Action) both assert that Ueda teaches the formation of "CeO<sub>2</sub>," for example stating at page 10, lines 15-16 "As ammonium cerium sulfate is used and heated, CeO<sub>2</sub> will be formed (providing Ce in the +4 oxidation state)." There is no teaching of "CeO<sub>2</sub>" in Ueda, nor any teaching of "cerium oxide with cerium in a +4 oxidation state."

The Advisory Action of September 19, 2005, makes a new and unfounded assertion that Ueda's approach "would inherently provide CeO<sub>2</sub>" (second page, in small print portion of Advisory Action, 4 lines from bottom). Applicant traverses this attempt to raise a new basis for rejection pertaining to "inherency" for the first time in the Advisory Action, literally in the "fine print." MPEP 2112-2113 sets forth the law on inherency. Inherency is improperly asserted unless there is good evidence to suggest that the asserted property or characteristic is necessarily present in the teachings of the prior art reference. See MPEP 2112(IV).

The concept of inherency is not a way to fill in the gaps in missing disclosure or teachings based upon speculation, unless the asserted property or characteristic may be shown to be necessarily present by objective evidence. Instead, "inherency" is used when every aspect of the disclosure of a reference and the claimed subject matter are otherwise exactly the same, then it may be inferred that some property or characteristic further recited in the claim must necessarily be present in the art reference. MPEP 2112 provides

The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic. In re Rijkman, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993); In re Oelrich, 666 F.2d 578, 581-82, 212 USPQ 323, 326 (CCPA 1981). "To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.'" In re Robertson, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999) (citations omitted)

Further, "[i]n relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art." Ex parte Levy, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990) (emphasis in original). No such basis in fact and/or technical reasoning was presented in the Advisory Action or elsewhere.

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The present rejection seeks to perform a hindsight reconstruction based upon unrelated references, which is technically unsupported and is legally improper.

The case authority and the MPEP provide guidance on this point. The present rejection is a §103 combination rejection. It is well established that a proper §103 combination rejection requires more than just finding teachings in the references of the elements recited in the claim (but which was not done here). To reach a proper teaching of an article or process through a combination of references, there must be stated an objective motivation to combine the teachings of the references, not a hindsight rationalization in light of the disclosure of the specification being examined. MPEP 2143 and 2143.01. See also, for example, In re Fine, 5 USPQ2d 1596, 1598 (at headnote 1) (Fed.Cir. 1988), In re Laskowski, 10 USPQ2d 1397, 1398 (Fed.Cir. 1989), W.L. Gore & Associates v. Garlock, Inc., 220 USPQ 303, 311-313 (Fed. Cir., 1983), and Ex parte Levengood, 28 USPQ2d 1300 (Board of Appeals and Interferences, 1993); Ex parte Chicago Rawhide Manufacturing Co., 223 USPQ 351 (Board of Appeals 1984). As stated in In re Fine at 5 USPQ2d 1598:

The PTO has the burden under section 103 to establish a prima facie case of obviousness. [citation omitted] It can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references.

And, at 5 USPQ2d 1600:

"One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention."

Following this authority, the MPEP states that the examiner must provide such an objective basis for combining the teachings of the applied prior art. In constructing such rejections, MPEP 2143.01 provides specific instructions as to what must be shown in order to extract specific teachings from the individual references:

Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention when there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); In re Jones, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

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"The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination." In re Mills, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990)."

\* \* \* \* \*

"A statement that modifications of the prior art to meet the claimed invention would have been 'well within the ordinary skill of the art at the time the claimed invention was made' because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a prima facie case of obviousness without some objective reason to combine the teachings of the references. Ex parte Levengood, 28 USPQ2d 1300 (Bd.Pat.App.& Inter. 1993)."

Here, there is set forth no objective basis for combining the teachings of the references in the manner used by this rejection, and selecting the helpful portions from each reference while ignoring the unhelpful portions. An objective basis is one set forth in the art or which can be established by a declaration, not one that can be developed in light of the present disclosure. As discussed above, Subramanian deals with thermal barrier coatings and Ueda deals with abrasives. A person of ordinary skill would have no reason to attempt to combine these teachings. Additionally, the technical teachings of the references are inconsistent. Ueda teaches that a compound, which is not cerium oxide, may be converted to cerium oxide, specifically that ammonium cerium sulfate may be calcined to cerium oxide. That teaching has no relevance at all to the teachings of Subramanian. Subramanian never teaches converting something that is not cerium oxide to cerium oxide, but in fact starts with a cerium-oxygen compound of the form  $C_zO_w$ , without ever defining  $z$  and  $w$  when  $C=Ce$ , and then reacts the cerium-oxygen compound with another oxide to get a more-complex oxide reaction product. There is no basis for combining the teachings of these references.

#### Claims 9 and 11

The prior discussion of the rejection of claims 1-7 is incorporated here, as some of the legal and factual issues are the same as for claims 9 and 11.

Claim 9 recites in part:

"infiltrating a cerium-oxide-precursor compound from an exposed surface of the primary ceramic coating into the primary ceramic coating, wherein the cerium-oxide-precursor compound is not cerium oxide with cerium in a +4 oxidation state,  
and

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heating the cerium-oxide-precursor compound to form cerium oxide with cerium in the +4 oxidation state adjacent to the exposed surface of the primary ceramic coating.” [emphasis added]

Subramanian teaches deposition of a compound that may be a cerium-containing compound of cerium and oxygen overlying an oxide thermal barrier coating material, and then reacts the cerium-containing compound with the thermal barrier coating material to make a more-complex oxide that is apparently not “cerium oxide with cerium in the +4 oxidation state”. Subramanian uses the term “precursor” to mean something very different from its use in the present claims. In the present claims, the term refers to a compound that is not cerium oxide with cerium in the +4 oxidation state, but which reacts to form cerium oxide with cerium in the +4 oxidation state, while in Subramanian it refers to a cerium-oxygen compound that is reacted with another oxide to form a reaction product; thence the cerium-oxygen compound is a precursor to the reaction product.

Thus, Subramanian has no teaching that the cerium-oxide-precursor compound is not cerium oxide with cerium in a +4 oxidation state, and that heating in an oxygen-containing atmosphere forms cerium oxide with cerium in the +4 oxidation state.

**Ground 3. Claim 10 is rejected under 35 USC 103 over Subramanian in view of Ueda, and further in view of Taylor U.S. Patent 5,520,516.**

Claim 10 depends from claim 9, and incorporates its limitations. The combination of Subramanian and Ueda does not teach these limitations for the reasons stated above, and which are incorporated here. Taylor adds nothing in this regard.

There is no objective basis for combining the teachings of Taylor with those of Subramanian and Ueda.



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**VIII. Summary and Conclusion.**

None of the references discloses, teaches, or suggests forming "cerium oxide with cerium in the +4 oxidation state," a key limitation found in all of the claims.

None of the references discloses, teaches, or suggests a "cerium-oxide-precursor compound [that] is not cerium oxide with cerium in a +4 oxidation state," which is then heated to form "cerium oxide with cerium in the +4 oxidation state."

Thus, neither the recited specific compounds nor the recited processing of Applicant's claimed inventions are disclosed, taught, or suggested by the prior art references, either taken alone or in combination.

Under these circumstances, the prior art cannot disclose or teach the limitations of the pending claims.

Applicant asks that the Board reverse the rejections.

Respectfully submitted,

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Dated: December 8, 2005

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APPENDIX I  
Copy of Claims Involved in the Appeal

1. A method for preparing a protected article, comprising the steps of  
providing the article;  
depositing a bond coat onto an exposed surface of the article; and  
producing a thermal barrier coating on an exposed surface of the bond coat, wherein the step  
of producing the thermal barrier coating includes the steps of  
depositing a primary ceramic coating onto the exposed surface of the bond coat,  
depositing a cerium-oxide-precursor compound onto an exposed surface of the  
primary ceramic coating, wherein the cerium-oxide-precursor compound is not cerium oxide  
with cerium in a +4 oxidation state, and  
heating the cerium-oxide-precursor compound in an oxygen-containing atmosphere to  
form cerium oxide with cerium in the +4 oxidation state adjacent to the exposed surface of  
the primary ceramic coating.
2. The method of claim 1, wherein the step of providing the article includes the step of  
providing the article as a nickel-base superalloy article.
3. The method of claim 1, wherein step of providing the article includes the step of  
providing the article in the form of a component of a gas turbine engine.
4. The method of claim 1, wherein the step of depositing the bond coat includes the step  
of  
depositing a diffusion aluminide or an aluminum-containing overlay bond coat.
5. The method of claim 1, wherein the step of depositing the primary ceramic coating  
includes the step of  
depositing yttria-stabilized zirconia as the primary ceramic coating.
6. The method of claim 1, wherein the step of depositing the cerium-oxide-precursor  
compound includes the step of  
furnishing  $(\text{NH}_4)\text{Ce}(\text{SO}_4)_3$  as the cerium-oxide-precursor compound.

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7. The method of claim 1, wherein the step of depositing the cerium-oxide-precursor compound includes the step of  
infiltrating the cerium-oxide-precursor compound into the exposed surface of the primary ceramic coating.

9. A method for preparing a protected article, comprising the steps of  
providing a nickel-base superalloy article that is a component of a gas turbine engine;  
depositing a bond coat onto an exposed surface of the article; and  
producing a thermal barrier coating on an exposed surface of the bond coat, wherein the step of producing the thermal barrier coating includes the steps of

depositing a yttria-stabilized zirconia primary ceramic coating onto the exposed surface of the bond coat,

infiltrating a cerium-oxide-precursor compound from an exposed surface of the primary ceramic coating into the primary ceramic coating, wherein the cerium-oxide-precursor compound is not cerium oxide with cerium in a +4 oxidation state, and

heating the cerium-oxide-precursor compound to form cerium oxide with cerium in the +4 oxidation state adjacent to the exposed surface of the primary ceramic coating.

10. The method of claim 9, wherein the step of depositing the primary ceramic coating includes the step of  
depositing yttria-stabilized zirconia having about 7 percent yttria by weight.

11. The method of claim 9, wherein the step of depositing the cerium-oxide-precursor compound includes the step of  
furnishing  $(\text{NH}_4)\text{Ce}(\text{SO}_4)_3$  as the cerium-oxide-precursor compound.

13. A method for preparing a protected article, comprising the steps of  
providing the article;  
depositing a bond coat onto an exposed surface of the article; and  
producing a thermal barrier coating on an exposed surface of the bond coat, wherein the thermal barrier coating comprises

a primary ceramic coating on the exposed surface of the bond coat, and

a sintering-inhibitor region at a surface of the primary ceramic coating, wherein the sintering-inhibitor region comprises cerium oxide with cerium in the +4 oxidation state in a

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concentration greater than a general cerium oxide concentration in the primary ceramic coating.

14. The method of claim 13, wherein the step of providing the article includes the step of providing the article as a nickel-base superalloy article.

15. The method of claim 13, wherein step of providing the article includes the step of providing the article in the form of a component of a gas turbine engine.

16. The method of claim 13, wherein the step of depositing the bond coat includes the step of depositing a diffusion aluminide or an aluminum-containing overlay bond coat.

17. The method of claim 13, wherein the step of producing the thermal barrier coating includes the step of depositing yttria-stabilized zirconia as the primary ceramic coating.

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## APPENDIX II

### Evidence Entered and Relied Upon in the Appeal

None.<sup>1</sup>

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<sup>1</sup> In the Response to Final Office Action, Applicant argued the composition of cerium oxide taught by Ueda based upon the disclosure of Ueda at col. 3, lines 2-5 and provided evidence in the form of stoichiometric calculations in an Appendix A attached to that Response. However, the Advisory Action of September 19, 2005 pointed out an error in Applicant's interpretation of this language of Ueda, rendering the evidence found in the Appendix nugatory and is therefore not relied upon for this Appeal.

In reviewing Ueda in light of the Advisory Action, Applicant agrees with the Examiner that Applicant's prior interpretation of Ueda's language at col. 3, lines 2-5 was incorrect. Applicant therefore formally withdraws this prior argument from the record.

Applicant incorrectly thought that the reference to the weight of cerium versus that of the "metal oxide" referred to the cerium oxide, but in view of other portions Ueda, Applicant now agrees that "metal oxide" refers to "a metal oxide selected from aluminum oxide and silicon oxide." The withdrawal of this specific argument and the evidence presented therewith does not alter Ueda's failure to disclose or teach "cerium oxide with cerium in a +4 oxidation state" or  $\text{CeO}_2$  in the context recited in the claims, expressly or inherently, nor do any of the other references of record teach "cerium oxide with cerium in a +4 oxidation state" or  $\text{CeO}_2$  in the context recited in the claims as discussed *supra*. In fact, it now appears that there is no way to calculate the chemistry of the cerium oxide or its oxidation state from the information in Ueda.

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### APPENDIX III

#### Related Proceedings

None.